OPERATING INSTRUCTIONS FOR

REMOTE ACTIVE VERTICAL ANTENNA,

MODEL RVA-25

SERIAL NO: Typical

FAIRCHILD

ELECTRO-METRICS

CORPORATION

MP MASTER

MA30037

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MODEL RVA-25

SERIAL NO: Typical

Fairchild/Electro-Metrics Corporation
100 Church St., Amsterdam, New York 12010
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TECHNICAL INFORMATION BULLETIN

TANGENTIAL SENSITIVITY

The following procedure is used to determine tangential sensitivity of the Remote Active Vertical Antenna Model RVA-25:

1. Remove dummy plug from EMC-25 and connect RVA-25 power cable.

2. Connect 25-foot RF cable "Sig. Out" on RVA-25 to "RF Input" on EMC-25.

3. EMC-25 front panel settings:

A.	RF Attenuator:	CAL position
B.	Bandwidth:	WIDE
C.	Audio:	CCW
D.	Dump:	CCW
E.	Slideback:	CCW
F.	Meter Function Switch:	Peak position
G.	Freq. Control:	To freq. desired.
H.	Tuning Mode:	Manual
I.	AFC:	OFF (Down)

4. Depress series CAL button on EMC-25 and set CAL control to some reference on EMC-25 meter (Noise).

5. Connect external IG (Empire Model IG-115 or equivalent) to "CAL IN" on RVA-25.

6. Adjust external IG output level until a "3 dB" rise above noise level is noted on the EMC-25 meter. This level is the broadband tangential sensitivity at the selected frequency.

7. For worst case sensitivities see Figure 3-2 in the RVA-25 instruction manual.

1.0 INTRODUCTION

This manual includes all relevant information for the successful operation of Remote Active Vertical Antenna, Model RVA-25, for use with Interference Analyzer EMC-25 or EMC-25R.

Fairchild/Electro-Metrics Remote Active Vertical Antenna, Model RVA-25, has been designed to provide for measurement of extremely low-level electric-field signals in the 14 kHz to 25 MHz frequency range when used in conjunction with the EMC-25 or EMC-25R Interference Analyzer (Bands #1-10).

2.0 THEORY OF OPERATION

2.1 GENERAL

Reference is directed to the functional block diagram Fig. 2-1 and the schematic diagram Fig. 2-2, in connection with the detailed discussion of the theory of operation.

The RVA-25 has two major modes of operation ("read" and "calibration") and two sub-modes ("low band and "high band"), all four modes being controlled by two binary logic inputs (Fig. 2-1 and 2-3) from the EMC-25 remote connector.

2.2 READ MODE

In the read mode the RVA-25 receives binary logic for either the low or high band from the band indicator switch A1A5S1AF, the low band being "0" and the high band "1", which is used to control relays K102, K103, and K104. A binary "0" voltage from the "Series Cal" switch A1S1 is also used for the control of K101 and K103. (Fig. 2.3)

2.2.1 READ MODE-LOW BAND

For the low band in the read mode, electric field signals intercepted by the 82" telescoping rod antenna are coupled to the source follower amplifier, Q_2, a field-effect transistor, through de-energized relay K101. The high input impedance of the source follower stage provides optimum loading for the rod antenna in the 14 kHz - 2.4 MHz range (Band 1-7 on EMC-25). The signal is then directly coupled to the base of a silicon planar transistor amplifier, Q_1, which through an emitter follower, Q_9, provides a low impedance output for coupling to the base of Q_{10} through

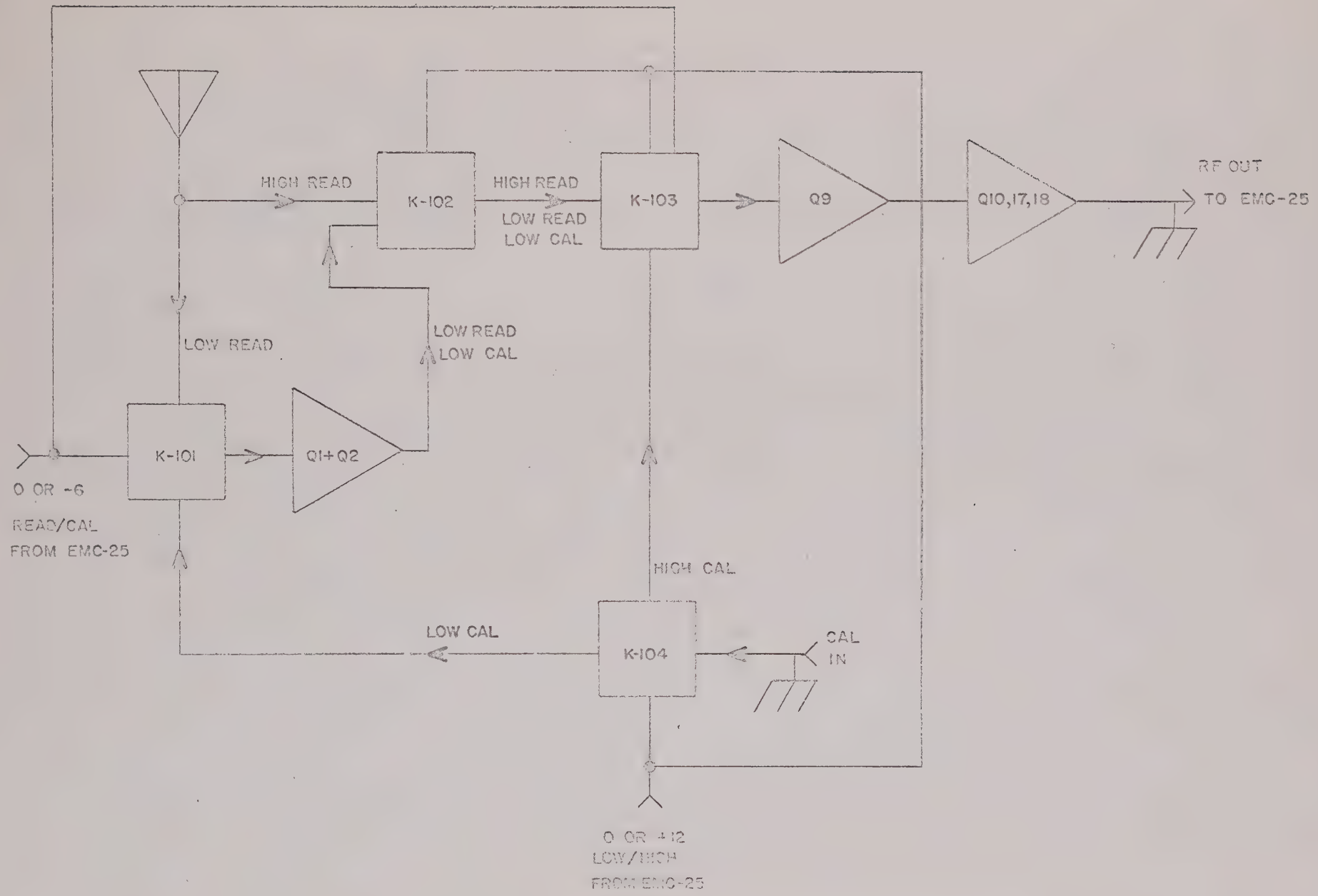
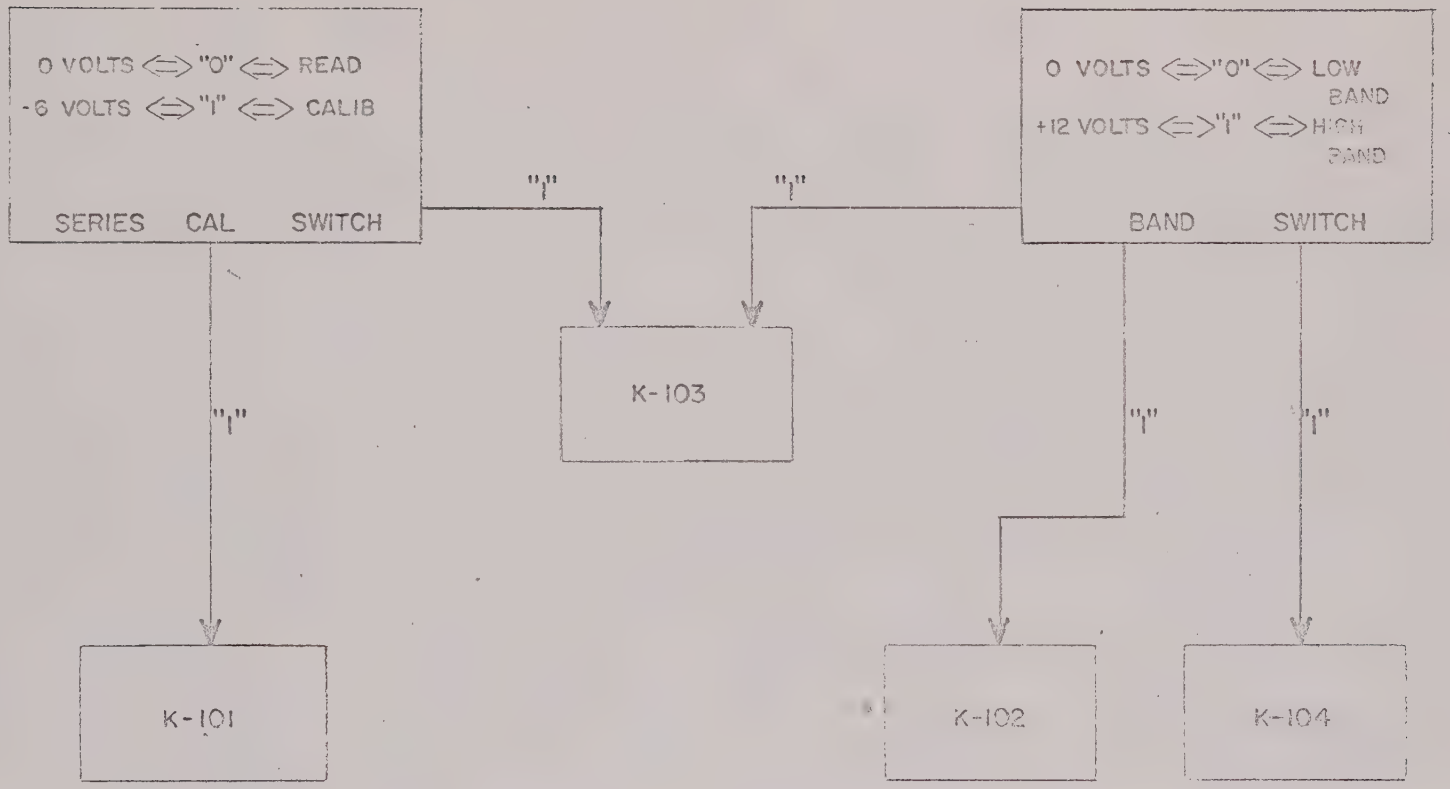


FIGURE 2-1 BLOCK DIAGRAM, Model RVA-25



"Numbers" between switches and relays describe logic that must be supplied to energize relays. Relay K-103 must receive a "1" logic from both switches before energizing.

FIGURE 2-3 LOGIC CONTROL DIAGRAM

de-energized relays K102 and K103. From Q_{10} the signal is capacitively coupled to Q_{17} for further amplification. The output of Q_{17} is coupled directly to Q_{18}, an emitter follower output stage which provides the output impedance of 50 ohms. Negative feedback is provided between Q_{18} and Q_{10} to increase the input impedance of Q_{10} and for circuit stability.

2.2.2 READ MODE-HIGH BAND

For high band operation in the read mode, electric field signals are again intercepted by the 82" telescoping antenna, but, because relay K102 has been energized by the "1" logic voltage from the band indicator switch of the EMC-25, they are coupled through K103 into the base of Q_9, by-passing the first two amplifier stages. The input impedance of approximately 150K ohms provides optimum loading for the rod antenna in the 2.4 - 25 MHz frequency range. From Q_9 to the RF output, the signal path is the same as it is for low band operation in the read mode.

2.3 CALIBRATION MODE

To switch from the read mode to the calibration mode, the "Series Cal" button on the EMC-25 is depressed. Depressing this switch furnishes the "1" logic to energize relay K101 which disconnects the rod antenna in the RVA-25. The RVA-25 is also fed binary logic for either low "0" or high "1" band from the band indicator switch, which controls relays K102, K103 and K104.

2.3.1 CALIBRATION MODE-LOW BAND

If the EMC-25 is feeding "0" logic from the band indicator switch, relays K102, K103 and K104 will be de-energized and the RVA-25 will be in the low band with the calibration signal coupled through two pi-section lowpass filters (L8, C18, C19 and L6, C9, C10) and through C8, a 22 pf. capacitor equivalent to the impedance of the vertical rod antenna.

The calibration signal then goes through energized relay K101 to the base of the source follower amplifier, Q_2, after which it travels the same path as does a signal in the low-band read mode.

2.3.2 CALIBRATION MODE-HIGH BAND

In the high calibration mode the EMC-25 feeds "1" logic from the band indicator switch to relays K102, K103 and K104, energizing them and changing the calibration signal path. In the high band calibration mode the calibration signal goes through a pi-section low-pass filter consisting of L8, C18, and C19 and then through energized relay K104 and through C17, a 22 pf. capacitor equivalent to the impedance of the antenna. The signal then goes through energized relay K103 into the base of emitter follower Q_9. From Q_9 the signal follows the same path as it does in the high-band read mode.

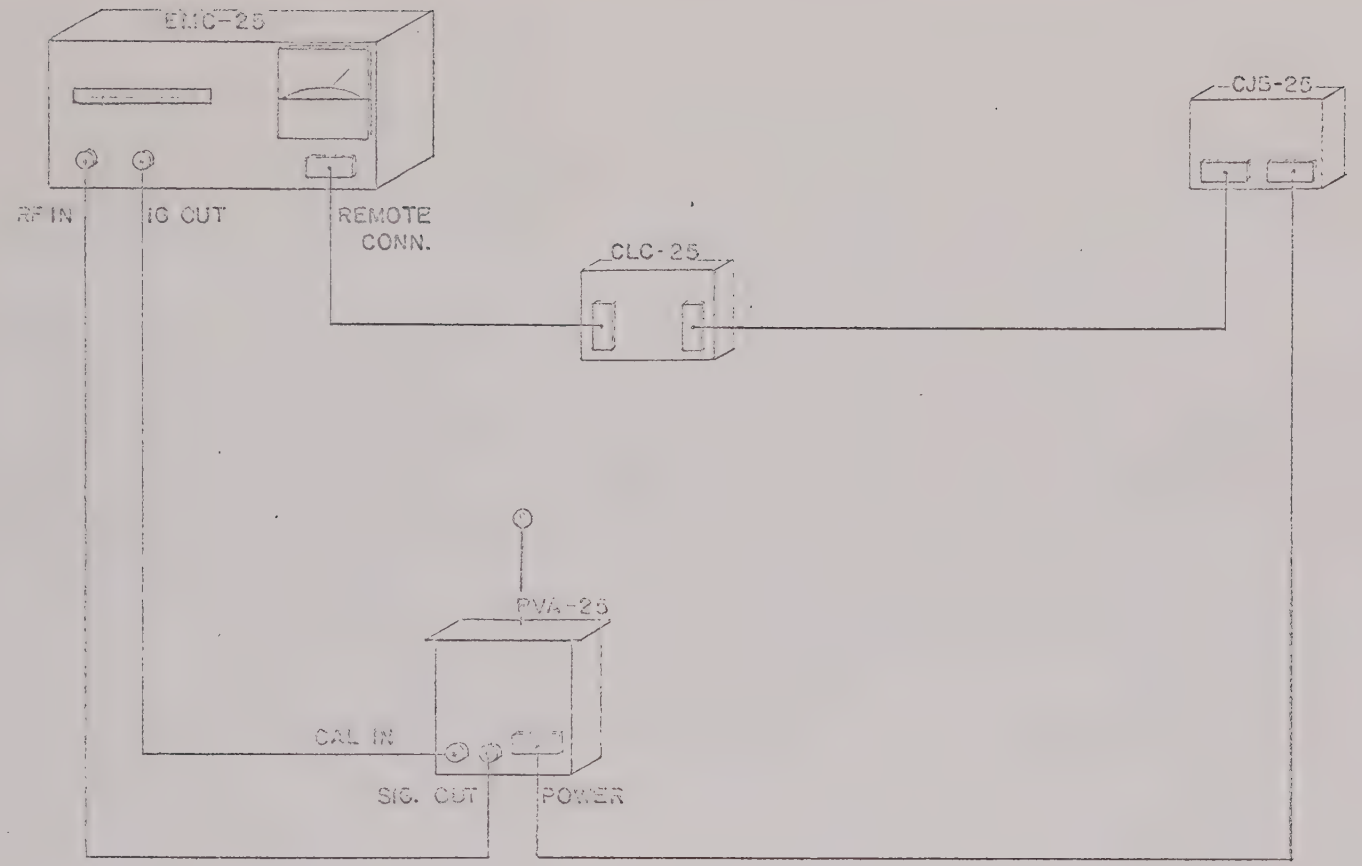


FIGURE 3-1 SYSTEM INTERCONNECTION

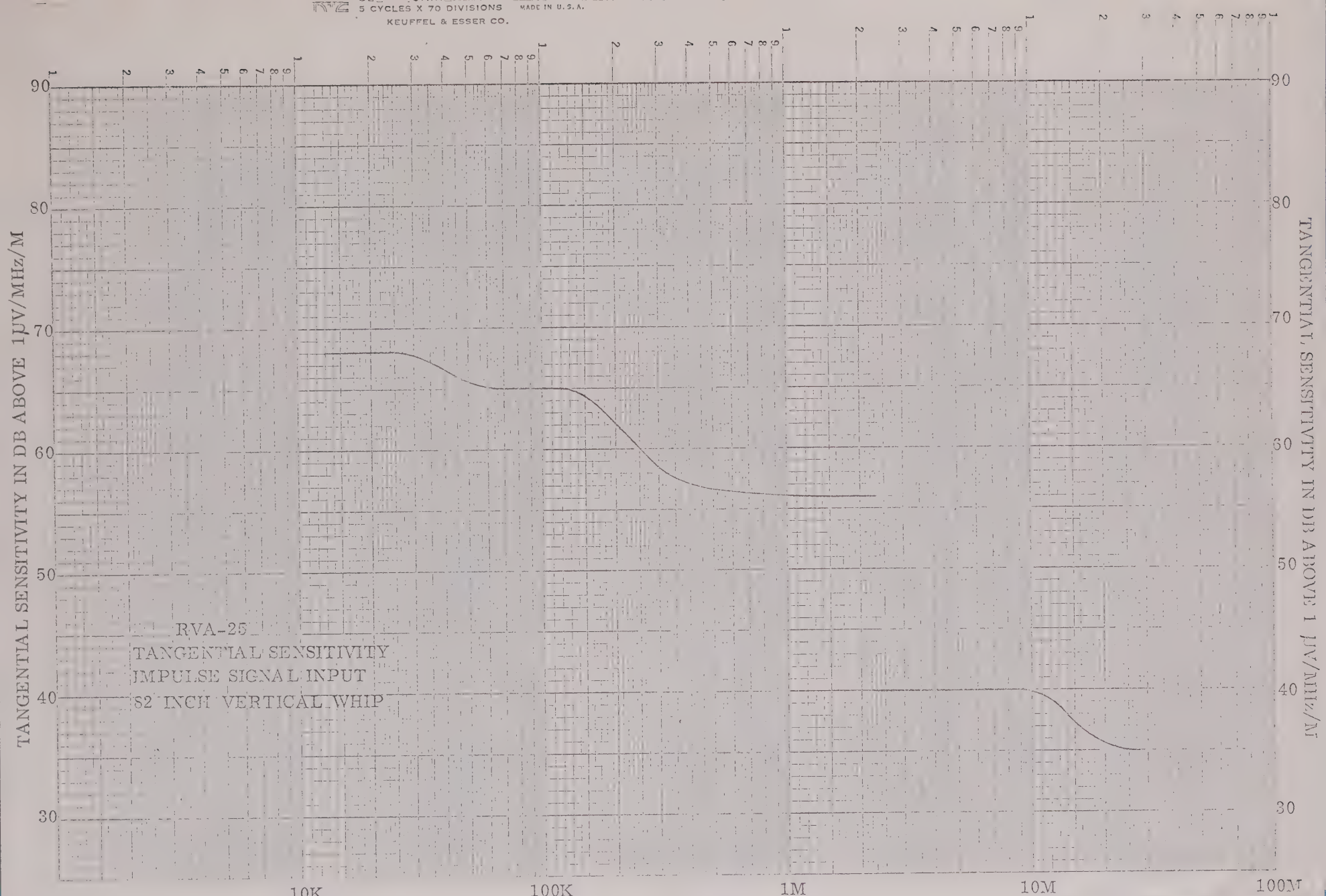


FIGURE 3-2 SENSITIVITY

3.4 PRE-OPERATIONAL CHECK

Before continuing, the coaxial cable between the EMC-25 and RVA-25 should be disconnected at the EMC-25 and a relative noise level noted. Reconnect the cable and notice a rise in this noise level assuring that the RVA-25 and EMC-25 are operative.

Care should be taken so as not to overload the RVA-25 and the EMC-25. Only low-level signals should be measured; the RVA-25 is not intended for use in those applications where high levels of broadband interference must be accurately measured. Broadband interference levels greater than 25 dB above the internal noise of the RVA-25 should be measured using Remote Vertical Antenna, Model RVR-25, which is a passive device.

3.5 SPECIFICATIONS

FREQUENCY RANGE

Low Band (Bands #1-7) 14 kHz to 2.4 MHz

High Band (Bands #8-10) 2.4 MHz to 25 MHz

INPUT IMPEDANCE (NOMINAL)

	Low Band	High Band
Antenna Input	25 Meg.	150 K
Calibrate Input	50 ohms	50 ohms

OUTPUT IMPEDANCE (NOMINAL) 50 ohms

DYNAMIC RANGE (NOMINAL)

(Narrowband)	75 dB
(Broadband)	25 dB

SENSITIVITY

See chart, Figure 3-2.

3.6 ELECTRIC FIELD MEASUREMENTS

3.6.1 NARROWBAND RADIATED SIGNALS

Connect the Remote Vertical Antenna Model RVA-25 as described in Paragraph 3.3, and in addition, connect a calibrated signal generator to the calibration input TNC connector on the RVA-25. Tune the EMC-25 to the frequency range of interest and set a convenient level on the EMC-25 meter for the particular signal of interest and note this level. Next, depress the "SERIES CAL" button on the EMC-25; this disconnects the vertical element and substitutes the calibration input internally in the RVA-25. Without changing gain or attenuator settings on the EMC-25, set the generator output level at the same frequency to read exactly the same level just noted on the front panel meter of the EMC-25 and record the generator level in dB referenced to one uv (dBuV).

Antenna factor is 0 dB for the 82" rod, so the level determined is also that in dBuV/meter. For a 41" length rod, add an antenna factor of + 6dB.

3.6.2 BROADBAND RADIATED SIGNALS

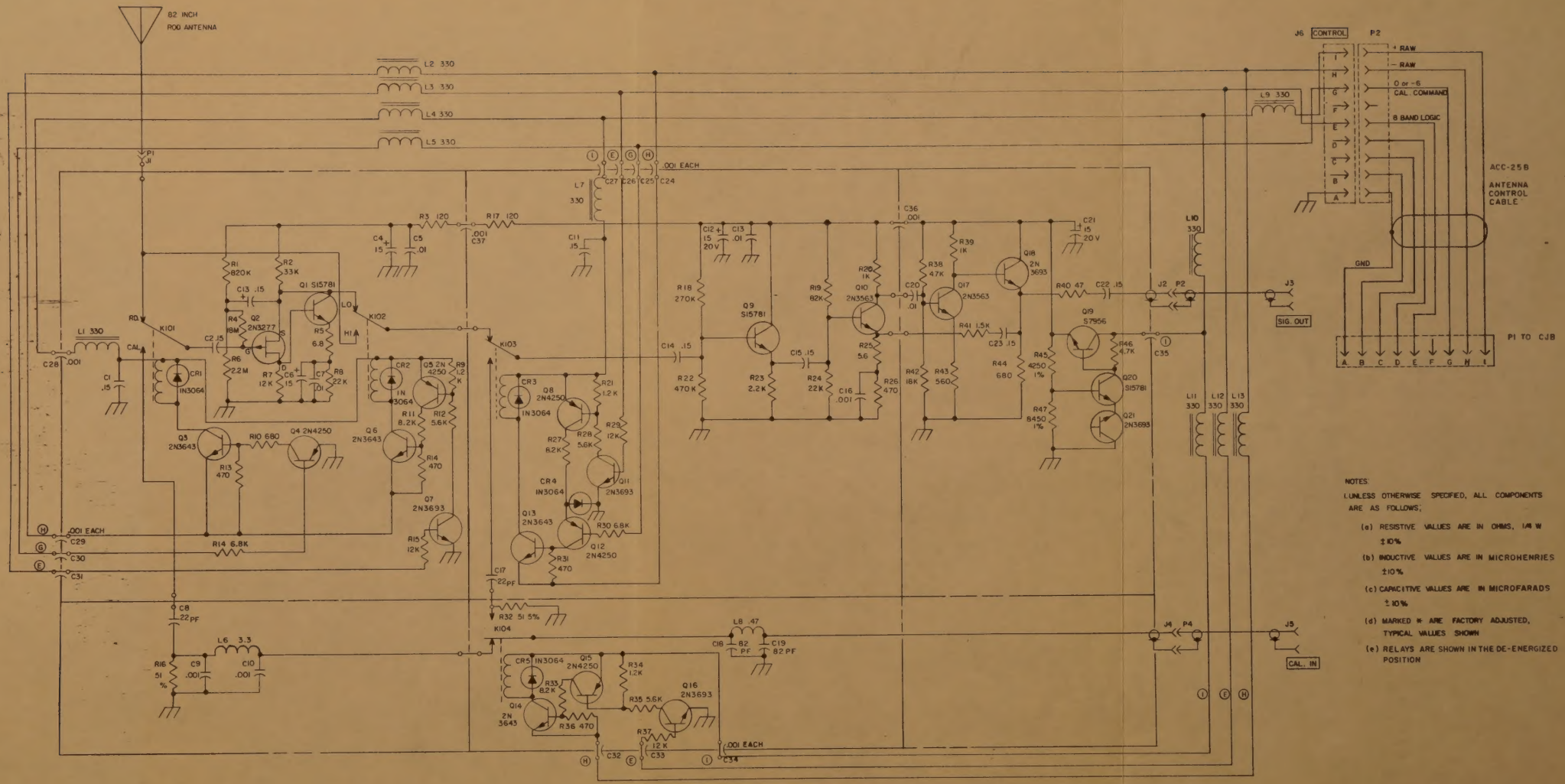
Measurement of broadband signals requires the use of the Model CLC-25, Calibrator Level Control and the Model CJB-25, Control Junction Box, in addition to the RVA-25 and EMC-25. The system is interconnected as shown in Fig. 3-1. An external impulse generator may be used in lieu of the CLC-25 (See final paragraph, this section.)

First, determine if the signal being measured is truly a broadband signal (see Par. 3.14 of EMC-25 Instruction Manual).

The EMC-25 should be in the SLIDEBACK detector function with the THRESHOLD knob turned all the way CCW. Tune the EMC-25 to the test frequency and adjust the THRESHOLD knob CW so that the detected signal level is just below the threshold of audibility in the headphones. Set the EMC-25 RF Attenuator to 20DB (black). For signals well above the noise level, the built-in "PEAK" metering function of the EMC-25 may be used.

Without changing any previous settings on the EMC-25, press the "SERIES CAL" button on the EMC-25 and adjust the output level of the internal EMC-25 I. G. using the CLC-25, until it can be heard in the headphones. Then reduce the level with the CLC-25 until it is just below the threshold of audibility (or until the previous "Peak" reading is duplicated). Record the level in dBuV/MHz indicated by setting of the CLC-25 controls. Antenna factor is 0 Db for the 82" rod, so the level determined is also that in dBuV/MHz/Meter. For the 41" rod add + 6Db antenna factor.

This test may also be performed using an external calibrated impulse generator with variable output and sufficient level to obtain a reading. In this event, the external I. G. would be fed into the calibration input on the RVA-25 and the CLC-25 would not be used. The power connection to the RVA-25 would be run directly to the CJB-25 and the signal output of the RVA-25 to the R. F. input of the EMC-25. However, "SERIES CAL" button on the EMC-25 would still have to be depressed to switch from "read" to "calibrate".



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE AS FOLLOWS;
   - (a) RESISTIVE VALUES ARE IN OHMS, 1/4 W ±10%
   - (b) INDUCTIVE VALUES ARE IN MICROHENRIES ±10%
   - (c) CAPACITIVE VALUES ARE IN MICROFARADS ±10%
   - (d) MARKED * ARE FACTORY ADJUSTED, TYPICAL VALUES SHOWN
   - (e) RELAYS ARE SHOWN IN THE DE-ENERGIZED POSITION

Schematic Diagram, Model RVA-25

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